

CLAIMS

1. A nuclear quadrupole resonance (NQR) inspection system for simultaneously detecting the presence of a plurality of target materials comprising transmission means for applying a pulsed radio frequency signal to a sample and a receiver circuit for receiving the return signal

wherein the transmission means and receiver circuit comprise a multi-resonant circuit tuned to simultaneously transmit and receive a plurality of signals at a plurality of predetermined frequencies which frequencies substantially match characteristic resonant frequencies of a plurality of target materials and the receiver circuit further comprises passive circuit protection means to permit simultaneous reception of a plurality of return signals.

2. A NQR inspection system according to claim 1 comprising a spectrometer capable of operating at a plurality of frequencies within a single pulse sequence.
3. A NQR inspection system according to claim 2 wherein the receiver circuit further comprises signal processing means adapted to modify a plurality of return signals so that they can be monitored simultaneously by the spectrometer.
4. A NQR inspection system according to claim 3 wherein the signal processing means comprises a signal generator which, in use, produces a phase coherent mixing signal of predetermined frequency to bring the plurality of return signals within the maximum bandwidth of the spectrometer.
5. A NQR inspection system according to any preceding claim wherein the passive circuit protection means comprises a lumped element quarter-wave unit tuned to provide protection of the receiver circuit during signal transmission whilst allowing the plurality of return signals to be received.

6. A NQR inspection system according to any preceding claim wherein the multi-resonant circuit comprises a tapped coil.
7. A NQR inspection system according to any preceding claim wherein the plurality of transmitted signals is applied to excite target materials in such a way that the plurality of return signals can be received simultaneously.
8. A NQR inspection system according to claim 7 wherein the plurality of transmitted signals is interleaved.
9. A NQR inspection system according to any preceding claim wherein the transmission means applies a steady state free precession pulse sequence at one of the characteristic resonance frequencies of RDX.
10. A NQR inspection system according to any preceding claim wherein the transmission means applies a pulsed spin locking pulse sequence at one of the characteristic resonance frequencies of PETN.
11. A NQR inspection system according to any preceding claim wherein the plurality of transmitted signals comprises a steady state free precession pulse sequence at 3.410 MHz interleaved with a pulsed spin locking pulse sequence at 0.890 MHz for the simultaneous detection of RDX and PETN.
12. A NQR inspection system substantially as described herein with reference to the accompanying drawings.